

CHAPTER 5

WATERSHED APPROACHES

5.1 Development of the Watershed Approach

In the past, most water pollution control efforts relied on broad-based, national programs targeted at reducing water pollution from point sources. These point sources included waste discharges from sewage treatment plants and industrial facilities. Although the applications of such programs were successful, they did not fully address water quality problems in the United States. Serious pollution problems still exist and continue to threaten public and environmental health. As an example, 40 percent of waters assessed by all states do not presently meet water quality goals. In addition, almost half of the nation's 2,000 major watersheds have serious or moderate water quality problems (Clean Water Action Plan, 1998).

New solutions to solving current water quality problems have been developed by the Environmental Protection Agency (EPA), the United States Department of Agriculture, and other federal agencies. They are documented in the Clean Water Action Plan (1998); a plan produced in response to a directive from the Clinton Administration to fulfill a goal of "fishable and swimmable" waters for all Americans (see Appendix A-5). A fundamental principle of this plan is the "watershed approach."

The key to the watershed approach is tailoring efforts of federal, state, and local governments, and the private and public sector to the particular needs of an individual watershed. Focusing on an individual watershed has several advantages. First, it helps identify the most cost-effective pollution control strategies to meet clean water goals. Second, it encourages public involvement since efforts to protect and restore water quality are geared towards local communities in a given watershed. Third, it provides greater accountability and progress in reaching clean water goals.

5.2 Application of the Watershed Approach in the State of Hawaii

Because of the unique properties of watersheds, application of the watershed approach would be more feasible on a watershed regional-basis. In Hawaii, there are 551 watersheds on the main Hawaiian Islands of Hawaii, Kauai, Maui, Molokai, Lanai, Kahoolawe, Ni'ihau and Oahu as indicated in the report entitled, *State Definition and Delineation of Watersheds* (1994). The watersheds are relatively small and characterized by fast flowing streams. Often, adjacent watersheds with degraded water resources drain into a single water body creating an impaired designation of the water body. Therefore, addressing individual watershed units may not significantly improve water quality problems in an associated water body. Similarly, designating each island as stand-alone or individual watersheds would create the complex task of solving a comprehensive, water quality problem. The federal government has made such a designation for each Hawaiian Island. In Hawaii, this is unrealistic and unlikely to provide any measurable benefit. Applying the watershed approach on a regional basis is the ideal situation in Hawaii.

A regional watershed approach also fits the State's current conditions from an environmental, economical and communal standpoint. Firstly, the State's water quality problems vary greatly from watershed to watershed and from region to region. Such variation in environment necessitates the prioritization of regions with seriously degraded water resources.

Secondly, the State is in an economic recession. Therefore, resources are limited and must be used to address the more serious water quality problems in the State. Finally, the State has strong, established community networks, which can provide (1) the public participation and (2) the local leadership responsibilities inherent in the regional watershed approach. A great challenge in using this approach; however, is trying to coordinate the responsibilities of all stakeholders and ensure establishment of a common direction to meet clean water goals efficiently and effectively.

A regional watershed approach to managing water quality is not a new concept in Hawaii. It has been documented in *In Re Boundaries of Pulehunui* (1879) that Hawaiians managed the environment and organized their society through land divisions called “ahupuaa.” The ahupuaa boundaries were similar to current watershed delineations. In each ahupuaa system, the entire area from land to sea was treated as one unit. Long ago, Hawaiians had recognized that what happens at the headwaters of the stream affects ecosystems throughout the watershed and coastal waters.

5.3 Unified Watershed Assessment

A key component of the watershed approach is the Unified Watershed Assessment,¹ an approach developed by EPA and other Federal agencies. The Unified Watershed Assessment aims to “unify” Federal and State activities related to identifying and prioritizing watersheds in need of restoration. The State finalized its Unified Watershed Assessment report in 1998; which identifies five priority watershed regions (see Table 5-1). These five watersheds will receive Clean Water Act Section 319(h) **incremental** funds to implement strategies aimed at solving water quality issues in the particular regions. Eighty percent of the Clean Water Act Section 319(h) incremental funds will be used for implementing watershed restoration strategies, while twenty percent will be used for assessment purposes (per federal requirements).

The Nawiliwili, South Molokai, and Koolaupoko watershed regions need more information regarding the sources of their water quality problems; therefore, more water quality assessment is necessary in these watersheds. The State will help these watershed regions complete their assessments by the end of the year 2000. Pelekane Bay and West Maui watershed regions have enough information and do not need to carry out further assessment activities. Instead, these watershed regions are ready to start restoration activities this year. Watershed projects will be implemented on a five-year schedule (see Table 5-2).

1 See pages 4-2 and 4-3.

Table 5-1 Hawaii's Five priority watershed regions as identified in <i>The Hawaii Unified Watershed Assessment</i> (1998).	
ISLAND	WATERSHED REGIONS
Hawaii	Pelekane Bay
Kauai	Nawiliwili
Maui	West Maui
Oahu	Koolaupoko
Molokai	South Molokai

Table 5-2 Timetable for implementing the 5 priority watershed projects.	
WATERSHED REGIONS	IMPLEMENTATION PLAN
Pelekane Bay, Hawaii	1999-2003
West Maui, Maui	1999-2003
Nawiliwili, Kauai	2000-2004
Koolaupoko, Oahu	2000-2004
South Molokai, Molokai	2000-2004

Watershed projects for the second tier of watershed regions (i.e., the next set of identified watershed regions in most need of restoration) will also be implemented on a five-year schedule. The State intends to implement projects for these watershed regions by 2004 or sooner if more resources are available. Similarly, a third set of watershed regions will be identified and implemented on a five-year schedule starting in 2009. Implementation projects for the second tier and third set of watershed regions will be called Phase II and Phase III of the State's Unified Watershed Assessment, respectively (see Table 5-3).

5.4 Watershed Restoration Action Strategies

Another element of the watershed approach identified in the Clean Water Action Plan is the formation of Watershed Restoration Action Strategies. These strategies comprise a three-step process, which involves:

- (1) identifying the causes of water pollution and resource degradation in a watershed;
- (2) detailing the actions of stakeholders in order to correct these problems, and
- (3) setting milestones in order to measure the progress of the restoration actions.

Currently, the State assists the selected lead organizations of the five priority watershed regions in completing Watershed Restoration Action Strategies (see table 5-3 for Lead Organizations). In addition, the State assists leaders in the implementation of best management practice and water quality monitoring activities. The State has distributed guidelines to the leaders in the five priority areas for the development and implementation of Watershed Restoration Action Strategies. Within each priority watershed region, the State will follow a phased approach that includes:

1. assessing potential sources of nonpoint pollution;
2. integrating partners and stakeholders, and identify their roles;
3. establishing water quality monitoring procedures and environmental objectives;
4. completing Total Maximum Daily Loads (TMDLs), where appropriate;
5. preparing watershed plan and Watershed Restoration Action Strategies including priorities, specific actions, coordinated policies, timelines, and funding needs;
6. implementing strategies; and
7. evaluating the effectiveness of the strategy and Best Management Practices (BMPs), and the impacts on water quality.

Table 5-3: Timetable for Implementing All Current DOH-connected Watershed Projects

Watershed Region	<i>Lead Organization</i>	<i>Partners</i>	<i>Source of Funds</i>	<i>WRAS</i>	Implementation	Evaluation
Pelekane Bay, Hawaii	Mauna Kea SWCD	NRCS, large landowners, UH-Hilo, Hawaii County, DOH, OP	Section 319(h) UWA funds, private, SWCD, OP	completed	1999-2003	2003
West Maui Water Quality Project	West Maui SWCD and West Maui Watershed Mngt. Advisory Committee	NRCS, Maui Land & Pineapple, Pioneer Mill Co., DLNR, DOT, and DOH, OP	Section 319(h) UWA funds, West Maui SWCD	completed	1999-2003	2003
South Molokai	Molokai/Lanai SWCD	NRCS, the Nature Conservancy, DOH, OP	Section 319(h), SWCD	2000	2000-2004	2004
Nawiliwili, Kauai	East Kauai SWCD	NRCS, others to be identified	Section 319(h) UWA funds, SWCD	2000	2000-2004	2004
Koolaupoko, Oahu	DOH	Windward Community College, community groups, C&C Honolulu, KBAC, Marine Corps Base Hawaii, OP	Section 319(h), KBAC C&C Honolulu	2000	2001-2004	2004
Ala Wai Canal Watershed Improvement Project	DOH Phase I Community Board Phase II	Federal, State, and County agencies, UH, community groups, and businesses	Federal funds through EPA	TMDL completed	1999-2001	2002
UWA Phase II Category I Watersheds	To be determined	To be determined	Section 319(h) UWA Funds	To be determined	2003-2008	2008
UWA Phase III Category I Watersheds	To be determined	To be determined	Section 319(h) UWA Funds	To be determined	2009-2013	2013

5.5 Partnerships with local organizations

The State encourages local Watershed Councils or other local organizations to lead watershed restoration efforts. As shown in Table 5-3, four out of the five lead organizations coordinating the development and implementation of Watershed Restoration Action Strategies are the local Soil and Water Conservation Districts on the islands of Maui, Molokai, Kauai and Hawaii. In the Ko'olaupoko watershed region, located on Oahu, a non-government organization or existing watershed council will coordinate the Watershed Restoration Action Strategies. Partners will include community and business groups, private landowners, and government agencies implementing projects in the region. The State will allocate Clean Water Act Section 319(h) **incremental** funds, matched by private and local government organizations, to initiate these assessments and strategies. Other agencies such as the Department of Land and Natural Resources and the USDA Natural Resources Conservation Service will target their resources and participate in the implementation of the Watershed Restoration Action Strategies. The State Department of Health (DOH) will distribute guidelines for the use of the funds along with the expected outcomes from the project. Watershed Restoration Action Strategies will include indicators to assure that water quality goals are met, with provisions to revise plans.

5.6 The Ala Wai Watershed Effort

The successes of a watershed approach in Hawaii can be exemplified by the Ala Wai Canal Watershed Improvement Project (AWCWIP). Since 1997, dedicated members of community, business, local, State and federal government, non-profit and environmental organizations have participated, and continue to participate in efforts to restore the Ala Wai Watershed (Oahu). The Ala Wai Watershed, composed of seven subwatersheds, drains in to the State's most polluted water body, namely, the Ala Wai Canal.

DOH had administered funds for Phase I of the project. Contracts were awarded to communities to implement water quality improvement projects in the watershed. Widespread community involvement, stakeholder participation, adoption of a cultural model, and commitment to restore the watershed through strong partnerships has resulted in Federal recognition of the project. On April 22, 1999, the EPA presented an "Outstanding Environmental Achievement" award to the Ala Wai Canal Watershed Improvement Project for demonstrating a successful approach to urban watershed management. Such success in Phase I led the DOH Polluted Runoff Control Program to turn over Phase II directly to the community.

5.7 The West Maui Watershed Effort

Another successful project that emphasized a community-based watershed approach to agricultural watershed management was the West Maui Watershed Management Project (WMWMP). The project was initiated in response to public concern over nuisance algal blooms and muddy coastal waters. Because of this project, a document was developed for the community that included recommendations for protecting and improving water quality and ocean resources in West Maui. The *West Maui Watershed Owners Manual* (1997) described all actions that the residents of the watershed should follow to protect both drinking water sources and

coastal waters. It also identified specific responsibilities for the owners of large plantations, and government agencies within the watershed region. The West Maui Watershed Management Project was funded by congressional appropriations through the DOH, the EPA and the National Oceanographic and Atmospheric Administration. It resulted in other commendable accomplishments as listed in Table 5-4.

Table 5-4
Accomplishments of the community-based West Maui Watershed Management Project

- Construction of 13 new sediment retention basins, 5 more planned.
- Volunteer coastal monitoring.
- New erosion control Best Management Practices at 22 locations on Maui Pineapple Company's Honolua Plantation.
- Revised Erosion and Sediment Control (grading) ordinance for Maui County.
- Two pollution prevention booklets: "Island Stewardship Guide to Preventing Water Pollution for Maui's Homes and Businesses" and "What Boaters can do to Be Environmentally Friendly."
- Sixty- percent reduction in nitrogen and phosphorous loadings to Lahaina's wastewater injection wells.
- New Maui County ordinance: "Use of Reclaimed Water."
- Irrigation of Kaanapali golf course with 1.23 millions of gallons per day reclaimed water.
- New Programs for cleaning algae from beaches.
- Publication of community based West Maui Watershed Owners Manual

New projects that have resulted from the West Maui Watershed Management Project include the Best Management Practice Implementation Project on Pioneer Mill (1998) and the Pollution Prevention Maui (P-2 Maui) Project (1999). These projects illustrate the ongoing efforts of residents to control and/or reduce nonpoint source pollution in the West Maui Watershed region.

5.8 Fostering the development of community-based watershed projects

The State aims to promote similar community-based projects in other watersheds, such as the five chosen priority watershed regions and additional watershed regions in the future. The State encourages watershed regions to demonstrate that: (1) strong partnerships are developing between stakeholders in a community, (2) responsibilities are being identified, and (3) decisions to carry out those responsibilities can be made. The State intends to work cooperatively with these locally led watershed initiatives.

Ala Wai Canal Watershed Improvement Project can serve as a model in the development of future urban watershed sites in Hawaii. The State intends to apply the methodology developed

by this project to other urban watersheds in Hawaii. Lessons learned from the project will demonstrate what may or may not work in the new sites. Facets of the project that the State hopes to replicate include:

- construction/selection of goals, objectives, and strategies;
- coordination of stakeholder responsibility and actions;
- implementation of identified action strategies; and
- development of milestones as a means to measure progress of the activities.

5.9 Limitations of a community-based watershed approach

The community-based watershed approach is not free of limitations. It is clear that communities in Hawaii are composed of diverse individuals with different views, backgrounds, and cultures. Therefore, individual views of the perceived needs of a watershed will frequently conflict. This creates a challenge for the community in terms of planning, decision-making, and agreement on goals, objectives, and strategies to achieve a healthy watershed. In addition, internal conflicts can make it difficult to coordinate activities with federal, State, and local governments, and the private sector. Time and money can be wasted if communities fail to come to agreement regarding efforts to protect and restore Hawaii watersheds.

5.10 Support of the watershed regional approach through Section 319(h) Projects: The Past

Over the course of its existence, the DOH Polluted Runoff Control Program has awarded and issued contracts to organizations implementing watershed-based projects. Some of these watersheds include the Pearl Harbor Watershed, the Kaiaka-Waialua Watershed region on Oahu and the Hamakua/Hilo Coast Watershed regions on Hawaii.

An example of a Section 319(h)-project funded in the Pearl Harbor Watershed was “Early Warning Indicators of Groundwater Contamination (1995).” The purpose of this project was to investigate potential nitrate contamination to ground water on lands converted from sugarcane and pineapple use to sustainable diversified agriculture in the Pearl Harbor watershed. The study confirmed that soils of the watershed, dominated by variable charge minerals, have the capacity to adsorb considerable quantities of nitrate. Furthermore, lime and leaching (i.e., soil management practices), which are applied to support the growth of diversified crops, change the charge characteristics of soils. This creates a potential danger to groundwater resources because high nitrate in soils used for sugarcane and pineapple crops can be released into ground water because of administering these practices. High nitrate concentrations have been known to induce a potentially lethal condition known as methemoglobinemia (‘blue baby’ syndrome) in infants. Therefore, the study not only demonstrated the interconnected relationship between land-based activities and water resources, but also the potential impact to public health.

A notable accomplishment in the Kaiaka-Waialua Bay Watershed region included the completion of the “Kaiaka Monitoring Project” (1995). The purpose of this project was to monitor the quantity of sediments, nutrients and organic (pesticides and toxins) being washed

from the land and subsequently contributing to nonpoint source pollution in Kaiaka Bay and Waialua Bay, Oahu. The study determined that suspended solids, turbidity, total phosphorus, and nitrate nitrogen were directly related to flow from upper to lower sampling sites. Furthermore, the study determined that the nine target pesticides and toxins were below the level of analytical detectability. Finally, the study demonstrated that the Opaepa drainage basin contributed significantly more pollutants on a per-acre basis than did the Anahulu drainage basin, with the exception of filtered phosphorus. The information gathered from this project provides useful and additional monitoring data that can be used in evaluating future restoration activities.

Funded in 1995, the “Watershed Stabilization on Former Sugarcane Lands of the Hilo Coast” project is nearing completion. It takes place in the Hamakua and Hilo Coast Watershed region, which drains into Hilo Bay, a water quality limited segment. The purpose of this project is to implement vegetative and structural controls on former sugarcane lands to reduce erosion. Best management practices included land-smoothing activities to level damaged lands and return them to their natural slope. The former sugarcane lands also require mowing operations to encourage the establishment of permanent ground cover plants, such as creeping grasses and legumes. Undesirable plants such as ratoon sugarcane and miconia are being eliminated in the process. Much progress has occurred as a result of these activities. For instance, 67 hours were devoted to land leveling, road repairs and conservation ditch maintenance. Hundreds of hours were committed to mowing more than 3,700 acres of the land, much of which affect the impaired water body, Hilo Bay.

All the accomplishments discussed provide specific information to the individual watershed regions. The information obtained will be useful in the event that future projects are implemented in these areas.

5.11 Support of the watershed regional approach through Section 319(h) Projects: The Present and Future

In Hawaii, protecting and restoring a priority watershed is an important criterion in selecting Section 319(h) projects. This is reflected in the State’s “Section 319(h) Proposal Evaluation Form”, which is used to score project proposals (see Appendix D). As documented in the evaluation form, more points are awarded to Category 1 Watersheds versus non-Category 1 Watersheds (see Appendix C for full Description of Watershed Categories). This indicates the intent of the State to target available resources to watersheds that are in most need of restoration. As an example, four out of eight projects receiving Section 319(h) funds in 1997 and three out of six receiving Section 319(h) funds in 1998 were Category I Watersheds, respectively. The State expects that greater emphasis on high priority areas will result in improved water quality in and around priority watersheds.

Typically, selected projects are based on the primary sources of polluted runoff problems generally encountered, namely, land based activities. For instance, projects addressing agricultural and/or urban activities that cause significant amounts of nonpoint source pollution are favorably considered during the selection process.

For those projects not selected to receive Clean Water Act Section 319(h) funds, there is another option. The DOH Polluted Runoff Control Program can provide money for water quality projects through a low interest loan. The name of the loan program is the State Revolving Fund (SRF). In the past, the State Revolving Fund program would only issue loans to improve or upgrade wastewater facilities. However, funding through this program is now more flexible. For instance, new water quality projects that have received State Revolving Fund loans include estuary projects and nonpoint source projects.

In 1998, the DOH Wastewater Branch, assisted by DOH Polluted Runoff Control Program, revised its SRF loan eligibility to accommodate funding of nonpoint source control projects. Currently only county or State agencies are eligible for such loans. The DOH Polluted Runoff Control Program will continue to work with DOH Wastewater Branch to initiate broader use of these funds to nonprofits or to specific associations to further implement best management practices in agricultural, wetland and urban sectors. Annually, DOH staff meets with county agencies to encourage their application for SRF funds for nonpoint source projects. The staff will look for innovative ways to further promote SRF loan use, such as distribution of a video displaying unique activities undertaken for watershed restoration funded by SRF or request to meet with county councilmembers to explain the program.

5.12 TMDL implementation/development

Total Maximum Daily Loads (TMDLs) indicate the maximum quantity of a pollutant that can enter a water body without adversely affecting the beneficial uses of the water body. TMDLs take into account all point and nonpoint sources of pollution in a watershed, as well as the physical characteristics of the water body itself. Once TMDLs are established, they can be used to assess the effectiveness of best management practices in a particular watershed region. Water quality monitoring should be carried throughout best management practice implementation and after implementation is complete.

The DOH Polluted Runoff Control Program intends to coordinate the five priority watershed region projects (identified in *The Hawaii Unified Watershed Assessment*) with existing monitoring activities of the DOH Clean Water Branch. The DOH Clean Water Branch has produced their FY-2000 Water Pollution Control Program (CWA 106) Work Plan, which indicates their current monitoring strategy. For example, the work plan documents how the DOH Clean Water Branch intends to establish baseline conditions of chemical, physical and biological indicators in watershed regions in order to characterize the impacts of pollution occurring in regional watersheds and its impact on receiving waters and coastal marine environments.

The DOH Clean Water Branch will establish Total Maximum Daily Loads on Oahu streams: Waimanalo stream during 1999-2000, and Kapaa and Kawa streams during 2000-2001. Information from these monitoring and assessment activities will be useful for the Polluted Runoff Control Program because a priority watershed region is associated with these streams. The Koolaupoko watershed region includes Waimanalo, Kapaa and Kawa streams, and the

receiving waters of Waimanalo Bay, Kawainui Marsh/Kailua Bay, and Kaneohe Bay, respectively.

The DOH will develop a strategy to complete and implement Total Maximum Daily Loads for the State's section 303(d) listed waters by 2012. The State and the EPA are currently developing a schedule to complete the TMDLs. The State will use the information generated from the TMDLs to target programs and projects to address the major sources of polluted runoff.

To complete each Total Maximum Daily Load, the State will follow these steps:

1. collect and evaluate existing water quality data;
2. develop and apply numerical models, if necessary;
3. establish the Total Maximum Daily Load;
4. prepare an implementation plan;
5. issue a public notice;
6. submit to EPA for approval; and
7. implement Total Maximum Daily Load plan

In summary, the State will use information from the priority watersheds, Total Maximum Daily Loads, and other watershed projects around the State to review priorities periodically. The State will also continue to rely on the input of government agencies, businesses, and non-government organizations to develop and adjust priorities. The State expects these projects and partnerships to provide a wealth of information that will lead to more effective implementation and corresponding improvements in water quality.

Summary of Activities by Year

2000

- Continue restoration activities for Ala Wai Watershed Region (Oahu).
- Continue restoration activities for Pelekane Bay Watershed Region (Hawaii).
- Continue restoration activities for West Maui Watershed Region (Maui).
- Complete WRAS and start restoration activities for Nawiliwili Watershed Region (Kauai).
- Complete WRAS and start restoration activities for South Molokai Watershed Region (Molokai).
- DOH Clean Water Branch will establish Total Maximum Daily Loads on Waimanalo Stream.
- Complete WRAS for Koolaupoko Watershed Region (Oahu).
- DOH Clean Water Branch will begin to determine the Total Maximum Daily Loads of Kawa Stream.

2001

- Continue restoration activities for Ala Wai Watershed Region (Oahu).
- Continue restoration activities for Pelekane Bay Watershed Region (Hawaii).
- Continue restoration activities for West Maui Watershed Region (Maui).
- Continue restoration activities for Nawiliwili Watershed Region (Kauai).
- Continue restoration activities for South Molokai Watershed Region (Molokai).
- Start restoration activities for Koolaupoko Watershed Region (Oahu).
- DOH Clean Water Branch will establish Total Maximum Daily Loads of Kawa Stream.

2002

- Evaluate restoration activities for Ala Wai Watershed Region (Oahu)
- Continue restoration activities for Pelekane Bay Watershed Region (Hawaii).
- Continue restoration activities for West Maui Watershed Region (Maui).
- Continue restoration activities for Nawiliwili Watershed Region (Kauai).
- Continue restoration activities for Koolaupoko Watershed Region (Oahu).
- Continue restoration activities for South Molokai Watershed Region (Molokai).
- DOH Clean Water Branch will begin to determine the Total Maximum Daily Loads of a stream or set of streams (currently unidentified) ^Δ.

2003

- Complete restoration activities for Pelekane Bay Watershed Region (Hawaii) and evaluate project.
- Complete restoration activities for West Maui Watershed Region (Maui) and evaluate project.
- Continue restoration activities for South Molokai Watershed Region (Molokai).
- Continue restoration activities for Nawiliwili Watershed Region (Kauai).

Δ Will occur annually.

- Continue restoration activities for Koolaupoko Watershed Region (Oahu).
- DOH Clean Water Branch will establish Total Maximum Daily Loads of a stream or set of streams (currently unidentified)^Δ.
- Begin implementation of projects for the second tier watershed regions in Category I (Phase II of the State's Unified Watershed Assessment).

2004

- Complete restoration activities for South Molokai Watershed Region (Molokai) and evaluate project.
- Complete restoration activities for Nawiliwili Watershed Region (Kauai) and evaluate project.
- Complete restoration activities for Koolaupoko Watershed Region (Oahu) evaluate project.
- DOH Clean Water Branch will begin to determine the Total Maximum Daily Loads of a stream or set of streams (currently unidentified).

2008

- Begin implementation of Phase III of Hawaii's Unified Watershed Assessment for Category I watersheds.

2012

- Complete Total Maximum Daily Loads for water bodies on the State's 303(d) list.

2013

- Complete restoration activities for Phase III of Hawaii's Unified Watershed Assessment for Category I watersheds.

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